(No Model.) 2 Sheets—Sheet 1.

ST. G. L. FOX.

ELECTRIC LAMP.

No. 251,774. Patented Jan. 3, 1882.

Fig. 1.

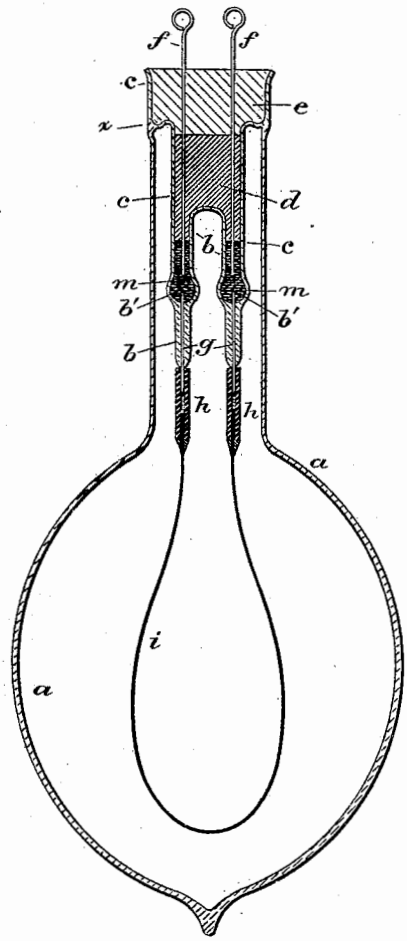
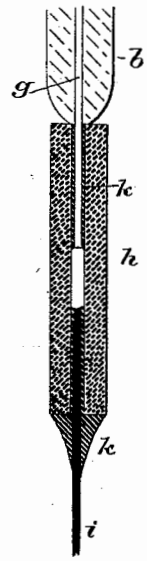


Fig. 1a.



WITNESSES:

E. B. Bolton

Geo. Bainton.

INVENTOR:

St. George Lane Fox,

By his Attorneys,

Burke, Fraser & Bonnell

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

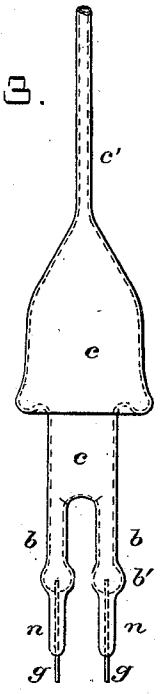


Fig. 2.

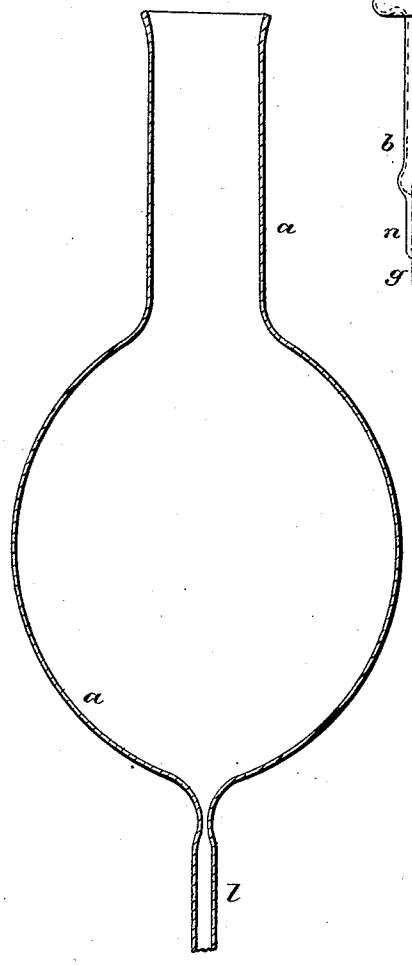
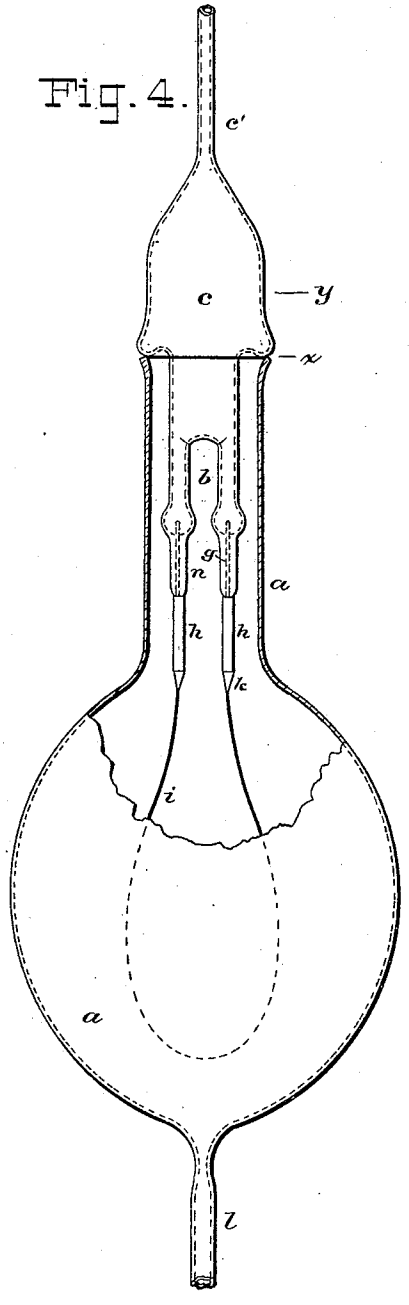


Fig. 4.



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INVENTOR:

St. George Lane Fox,

By his Attorneys,

Burke, Fraser & Connett

UNITED STATES PATENT OFFICE.

ST. GEORGE LANE FOX, OF LONDON, ENGLAND.

ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 251,774, dated January 3, 1882.

Application filed June 15, 1881. (No model.) Patented in England August 28, 1880.

To all whom it may concern:

Be it known that I, ST. GEORGE LANE FOX, of London, England, have invented certain Improvements in Electric Lamps, of which the following is a specification.

This invention is in part the subject of Letters Patent granted to me in Great Britain, dated the 28th August, 1880, No. 3,494.

The improvements have reference to those electric lamps in which the light is produced by the incandescence of a continuous conductor or luminous bridge, and their object is to improve the connection between the luminous bridge and the conducting-wires or terminals, and at the same time to prevent leakage of air into the lamp.

Figure 1 of the accompanying drawings is a vertical section of an electric lamp constructed according to my invention.

a is the flask or globe.

b b are glass tubes containing mercury. These tubes are closed at their upper ends by a layer of marine glue, *d*, and a layer of plaster-of-paris or other cement, *e*. The top of the neck of the flask is hermetically closed by uniting thereto, at the point *x*, by the ordinary glass-blowing process, the upper part of the glass piece *c*, which carries the mercury-tubes *b b*.

f f are the conducting-wires or terminals. They are inserted into the tubes *b b* and extend down into the mercury *m* therein.

g g are the platinum wires. They extend up through the bottom of the tubes *b b*, into which they are fused. The tubes should be of lead-glass, because without the lead the glass and platinum will not adhere together without difficulty, and the glass is liable to crack. The rest of the flask or globe may be made either of lead-glass or of glass such as "German glass," which has no lead in it.

It will be readily understood that as the platinum wires *g g* and the conducting-wires *f f* both terminate in the mercury in the tubes *b b* the mercury forms the electric communication or connection between them. The chief object of the mercury is, however, to prevent leakage of air into the lamp through any minute aperture which may exist where the platinum wires are fused into the glass.

The lower parts of the tubes *b b* are preferably formed of the enlarged or bulb shape shown at *b' b'*, as I find that if they are cylindrical or at all tapered the air, having no room to escape when the mercury is poured in, is liable to remain in the bottom of the tubes, from which it gradually finds its way into the flask and destroys the vacuum therein.

Prior to my invention, when mercury-seals have been used at the point of emergence of the platinum wires through the glass, the wires have been continued out through the neck of the flask and there connected with the line-wires. In such construction the platinum wires are apt to get pulled or twisted, which is likely to impair their connection with the glass where they and the glass are fused together, the union of metal with glass by fusion being at best but an imperfect one. To avoid this disadvantage, I continue the platinum wires only into the mercury, and make the connection through the remaining portion of the neck by wires *f f*, (of copper, for instance,) the mercury making electrical connection between the two, so that no serious damage can be done the lamp by any pulling or disarrangement of the wires *f f*, and even if they were to be pulled entirely out it would only be necessary to dig out the layers *e d*, replace the wires, and fill in new cementing material in place of that removed. I also by this construction save the difference of cost between platinum and copper for the length of the wires *f f*, which, owing to the great expense of platinum, is considerable.

With mercury-seals as heretofore made no means have been provided for retaining the mercury in place around the point of emergence of the platinum wire from the flask in case the lamp were laid on its side or were inverted, as is apt to be the case in shipment and handling. If the mercury becomes displaced, air is likely to leak through the fused joint into the flask and impair the vacuum therein. My construction effectually prevents this displacement, the mercury being closely covered over with a plastic substance, which soon hardens, and prevents any movement of the mercury.

The lower ends of the platinum wires *g g*, which need only be about three-fourths of an inch long, are thrust into holes drilled through cylinders or blocks *h h*, of carbon or plumbago. I cement them in these holes, and the cement I use for this purpose is Indian or Chinese ink,

either alone or mixed with some other material, such as plumbago or carbon. I find this cement makes a good connection, particularly after it has become charred by the heat of the lamp.

In order to give the cement a better hold, the wires may be roughened by having a screw-thread formed thereon, or otherwise.

i is the continuous conductor (carbon filament) or luminous bridge. Its ends are thrust into holes or slits in the cylinders *h h*, so that they may meet the platinum wires *g g*, (but it is not necessary they should meet,) and they are similarly cemented into these cylinders by a cement of Indian or Chinese ink. This ink is applied to the ends of the bridge *i* and dabbed round the holes in the cylinders *h h*, as seen at *k k*. The construction of these connections is best shown in Fig. 1ª, which is a fragmentary longitudinal section thereof on an enlarged scale.

Prior to my invention a mixture of lamp-black and tar has been used to cement a carbon filament to the leading-in wires; but it is defective for the purpose, as it requires to be carbonized at a white heat before it becomes a conductor. The same is true of spurious Indian ink, which is a compound of lamp-black and gum. The particles of carbon are so separated by the gum as to be insulated from each other, and the gum has to be carbonized at a high temperature before the ink will conduct; but with the genuine Indian or Chinese ink, the manufacture of which is a secret, and which is thought to contain camphor, or some analogous material as a binding agent, no carbonization is necessary, as it conducts sufficiently well when first applied. I use this Indian ink in connection with the carbon or plumbago blocks or cylinders, as it is not sufficiently strong by itself to make a reliable mechanical connection.

The manner in which the parts of the lamp may be put together will be understood by Figs. 2, 3, and 4. Fig. 2 represents the flask *a* as it is blown in the first instance. It has a hole at bottom from which a tube, *l*, leads. Fig. 3 represents the piece *c*. It is hollow, and is blown with the tube *c'* at its upper part. From its lower part depend the tubes *b b*. The parts *n n* below these tubes are solid, and have the platinum wires *g g* fused into them. After the carbon cylinders *h h* have been thrust over the ends of the wires *g* and the end of the luminous bridge *i* has been thrust into the cylinders *h h* the piece *c* is placed over the flask *a*, so that the tubes *b b* and other parts may enter the neck of the flask, as seen in Fig. 4. The glass of the piece *c* and of the flask-neck, at their point of junction *x*, are then united together by blowing and fusing in the ordinary manner, and the piece *c* is then severed at the point *y*. The mercury is then poured into the tubes *b b*, the copper terminals *f f* inserted, and the marine glue and plaster-of-paris introduced over the mercury. There now only remains to produce the requisite vacuum in the flask, and this is effected by exhausting through the tube *l*. When the vacuum has been produced the tube *b* is closed by fusion, as in Fig. 1. The luminous bridge *i* is raised to a state of incandescence during the exhausting operation by passing an electric current through it, and the exhausting is continued until gases cease, or almost cease, to be given off.

What I claim, and desire to secure by Letters Patent, is—

1. An electric lamp consisting of the combination of a vacuum-flask, *a*, incandescent bridge or filament *i* therein, two tubes, *b b*, projecting into said flask, leading-in wires *g g*, fused into said tubes, their inner ends connected to the end of the filament *i* and their outer ends projecting up into the tubes *b b*, a portion of mercury in each tube *b* covering the point of emergence of the wires *g g*, and terminal wires *f f*, passing through the neck of the flask, and each extending into one of the tubes *b b* and dipping into the mercury therein, whereby the mercury serves both to prevent leakage of air into the flask and to make connection between the wires *f* and *g*, substantially as set forth.

2. An electric lamp consisting of the combination of vacuum-flask *a*, incandescent bridge or filament *i* therein, tubes *b b*, projecting into said flask, leading-in wires *g g*, fused into said tubes and connected with the ends of said filament, a portion of mercury in each of said tubes around said wires, and a layer of hardened plastic substance over said mercury, whereby the latter is retained in place whatever be the position of the lamp, substantially as set forth.

3. An electric lamp consisting of the combination of a vacuum-flask, *a*, an incandescent bridge or filament, *i*, therein, leading in wires *g g*, fused into said flask, carbon or plumbago blocks or cylinders *h h*, each receiving in its sockets the end of one of said wires and one end of the filament, and genuine Indian or Chinese ink *k*, applied substantially as described, and for the purposes set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ST. GEORGE LANE FOX.

Witnesses:
GEORGE C. BACON,
HUGH P. HOUGHTON.